

CLAIMS

What is claimed is:

1. An optical recording medium comprising:
a wobbled track on which user data is recorded; and
a header area in which a header signal having multi-modulated header information is recorded.
2. The optical recording medium of claim 1, wherein the multi-modulated header information comprises first and second header information modulated according to a first type and a second type of modulation, respectively, and which overlap each other in at least some intervals of the header signal.
3. The optical recording medium of claim 2, wherein the first type of modulation is one of phase modulation, frequency modulation, and amplitude modulation, and the second type of modulation is one of the remaining two types of modulation not provided in the first type of modulation.
4. The optical recording medium of claim 1, wherein the multi-modulated header information comprises first through third header information modulated according to first through third types of modulation and which overlap one another in at least some intervals of the header signal.
5. The optical recording medium of claim 4, wherein the first type of modulation is one of phase modulation, frequency modulation, and amplitude modulation, the second type of modulation is one of the remaining two types of modulation not provided by the first type of modulation, and the third type of modulation is the last type of modulation not provided by the first and second type of modulation.
6. The optical recording medium of claim 1, wherein first through N-th header information modulated according to first through N-th types of modulation, respectively, overlap one another in at least some intervals of the header signal.

7. The optical recording medium of claim 1, wherein the header area further comprises a header flag region including a flag signal to indicate a beginning of the header area positioned between adjacent wobbled tracks.

8. The optical recording medium of claim 7, wherein the flag signal comprises a direct current signal is recorded in the header flag region.

9. The optical recording medium of claim 7, wherein the flag signal in the header flag region is a mirror region.

10. The optical recording medium of claim 1, wherein said wobble track is a wobble signal having a single frequency.

11. The optical recording medium of claim 10, wherein the header signal has a frequency higher than the single frequency of the wobble signal.

12. The optical recording medium of claim 1, wherein said wobbled track and said header area are positioned alternately.

13. The optical recording medium of claim 12, wherein said wobbled track comprises a user data area to record user data and includes land and groove tracks.

14. A method of recording header information in a header area on an optical recording medium on which a wobble signal is recorded, the method comprising :
generating a header signal having multi-modulated header information; and
recording the generated header signal.

15. The method of claim 14, wherein said generating the header signal comprises:
generating the header signal having at least some intervals where first and second header information modulated according to a first type and a second type of modulation, respectively, overlap each other.

16. The method of claim 15, wherein the first type of modulation is one of phase modulation, frequency modulation, and amplitude modulation, and the second type of modulation is one of the remaining two types of modulation not provided in the first type of modulation.

17. The method of claim 14, wherein said generating the header signal comprises: generating the header signal having at least some intervals where first through third header information modulated according to first through third types of modulation, respectively, overlap one another.

18. The method of claim 17, wherein said generating the header signal comprises : modulating the first header information according to the first type of modulation; modulating the second header information according to the second type of modulation; modulating the third header information according to the third type of modulation; and overlapping ones of signals obtained in the modulating the first through third header information.

19. The method of claim 18, wherein the first type of modulation is one of phase modulation, frequency modulation, and amplitude modulation, the second type of modulation is one of the remaining two types of modulation not provided in the first type of modulation, and the third type of modulation is the last type modulation not provided in the first and second type modulation.

20. The method of claim 14, wherein the wobble signal has a single frequency.

21. The method of claim 20, wherein the header signal has a frequency higher than the single frequency of the wobble signal.

22. The method of claim 14, wherein the wobbled track and the header area are positioned alternately.

23. An apparatus to record a header signal in a header area on an optical recording medium on which a wobble signal is recorded, the apparatus comprising:

a multi-modulator multi-modulating header information to generate a header signal; and
a recording unit to record the generated header signal.

24. The apparatus of claim 23, wherein said multi-modulator generates the header signal including at least some intervals where first and second header information modulated according to a first type and a second type of modulation, respectively, overlap each other.

25. The apparatus of claim 23, wherein said multi-modulator comprises:

a first modulator to modulate a first header information according to a first type of modulation;

a second modulator to modulate a second header information according to a second type of modulation; and

a signal synthesizer to overlap signals output from the first and second modulators in at least some intervals of the modulated header signals.

26. The apparatus of claim 25, wherein the first type of modulation is one of phase modulation, frequency modulation, and amplitude modulation, and the second type of modulation is one of the remaining two types of modulation not provided in the first type modulation.

27. The apparatus of claim 23, wherein the multi-modulator comprises:

a first modulator to modulate a first header information according to a first type of modulation;

a second modulator to modulate a second header information according to a second type of modulation;

a third modulator to modulate a third header information according to a third type of modulation; and

a signal synthesizer to overlap signals output from the first through third modulators in at least some intervals of the modulated header signals.

28. The apparatus of claim 27, wherein the first modulator performs one of phase modulation, frequency modulation, and amplitude modulation, the second modulator performs one of the remaining two types of modulation not provided in the first type modulation, and the third modulator performs the last type modulation not provided in the first and second type modulation.

29. A method of reproducing header information from a header area on an optical recording medium on which a wobble signal is recorded, the method comprising :
reading a header signal having multi-modulated header information;
demodulating at least some intervals of the read header signal according to a first type of demodulation to obtain first header information;
demodulating the intervals of the read header signal according to a second type of demodulation to obtain second header information; and
combining the demodulated first and second header information, respectively, to output the combined header information.

30. A method of reproducing header information from a header area on an optical recording medium on which a wobble signal is recorded, the method comprising :
reading a header signal having multi-modulated header information;
demodulating some intervals of the read header signal according to a first type of demodulation to obtain first header information;
demodulating the intervals according to a second type of demodulation to obtain second header information;
demodulating the intervals according to a third type of demodulation to obtain third header information; and
combining the demodulated first through third header information to output the combined header information.

31. An apparatus to reproduce header information from a header area on an optical recording medium on which a wobble signal is recorded, the apparatus comprising:
a reading unit to read a header signal having multi-modulated header information;
a first demodulator to demodulate at least some intervals of the read header signal according to a first type of demodulation and to obtain first header information;

a second demodulator to demodulate the intervals according to a second type of demodulation and to obtain second header information; and

a header information synthesizer to combine the first and second header information and to output the combined header information.

32. The apparatus of claim 31, further comprising a third demodulator demodulating the intervals according to a third type of demodulation to obtain third header information, wherein the header information synthesizer combines the third header information with the first and second header information.

33. An apparatus to record a header signal on and reproduce header information from a header area on an optical recording medium on which a wobble signal is recorded, the apparatus comprising:

header signal recorder comprising:

a multi-modulator multi-modulating header information to generate a header signal;

a recording unit to record the generated header signal; and

a header signal reproducer comprising:

a reading unit to read a header signal having multi-modulated header information;

a first demodulator to demodulate at least some intervals of the read header signal according to a first type of demodulation and to obtain first header information;

a second demodulator to demodulate the intervals according to a second type of demodulation and to obtain second header information; and

a header information synthesizer to combine the first and second header information and to output the combined header information.